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# Ultra-stable Laser system for Photocathode RF gun Applications

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## Pulrise: Stable UV Laser for Photoinjector

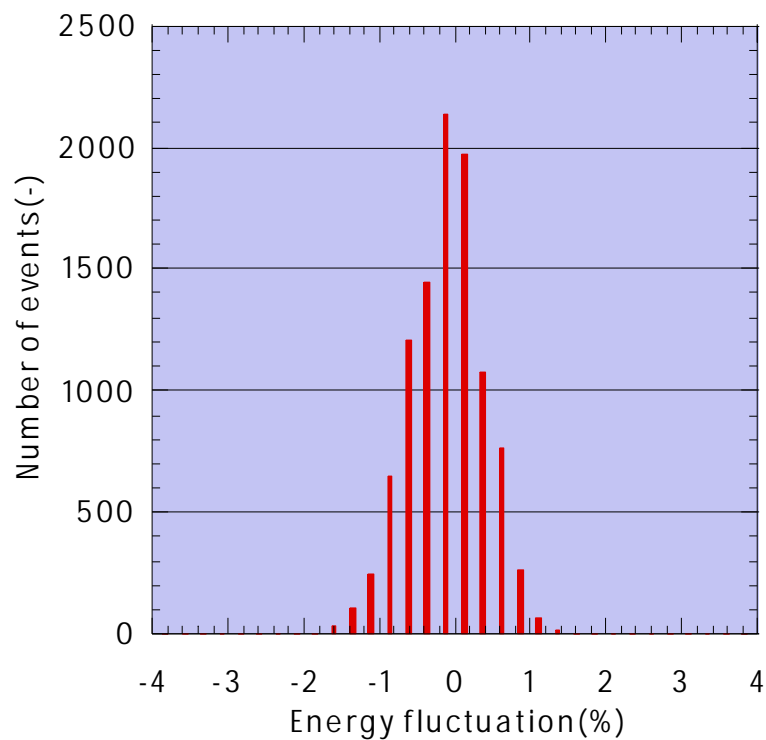
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Laser medium	Nd:YLF
Pulse width	12 ps @1047 nm, 8 ps @262 nm
Pulse energy	2 mJ @1047 nm, 0.2 mJ @262 nm
Jitter	<0.5 ps RMS
Dimension	600 mm(W)X900mm(D)X300mm(H)
Repetition rate	25 Hz (100 Hz available)

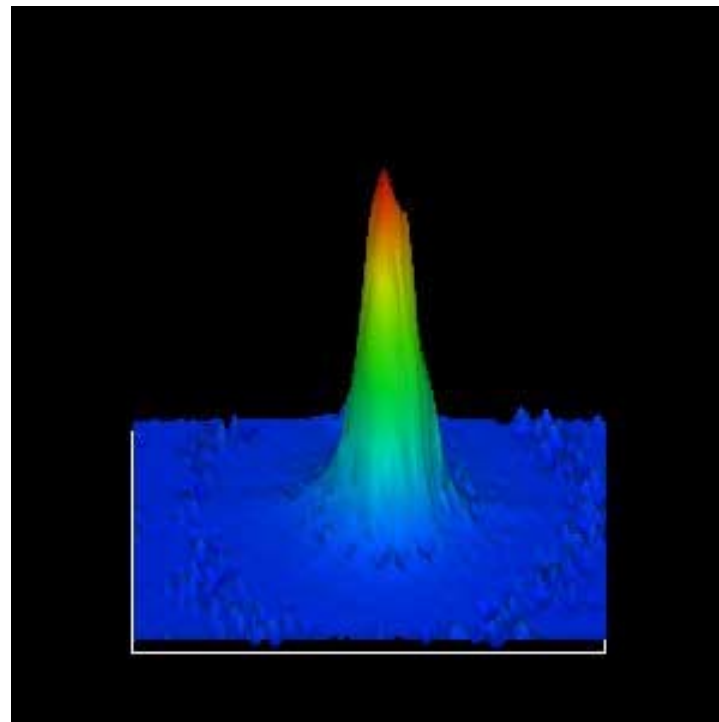
# Stability of Pulrise

Energy stability (IR)



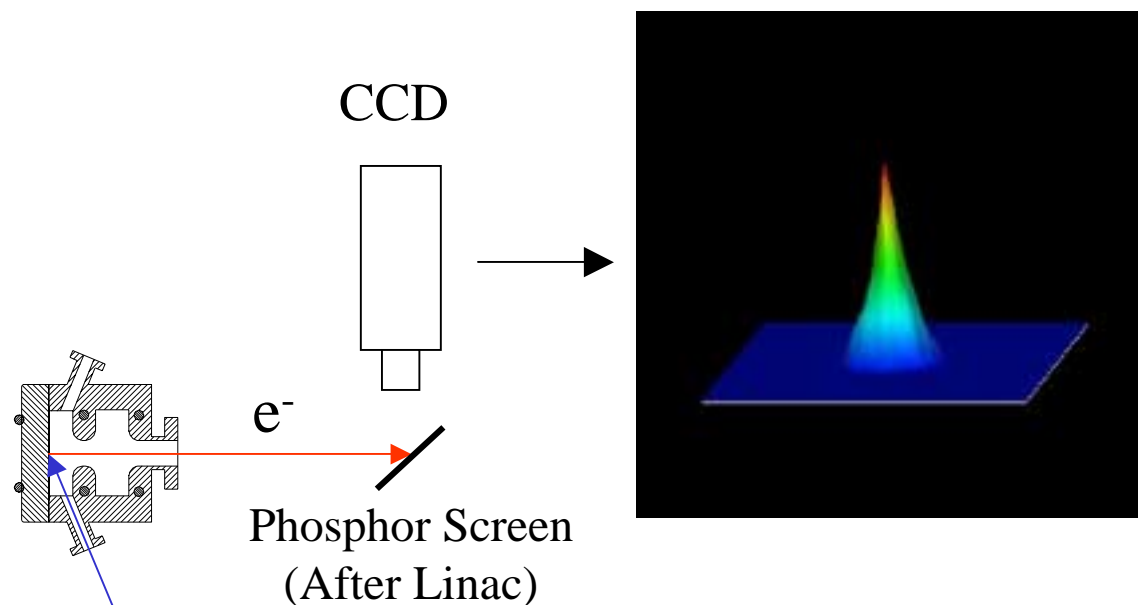
Total shot number	10000
Standard deviation	0.55%

Beam profile (IR)



Pointing stability  $\sigma=5\mu\text{rad}$

# Electron Bunch Characteristics

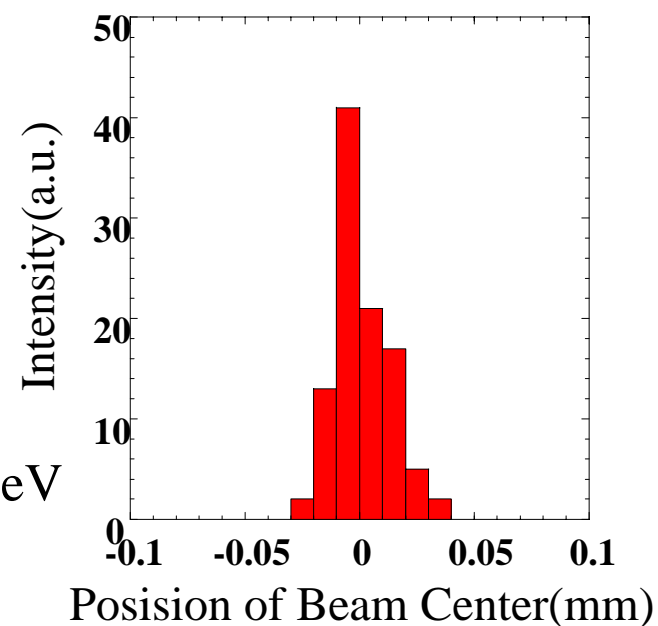


Beam size  $\sigma < 100 \mu\text{m}$

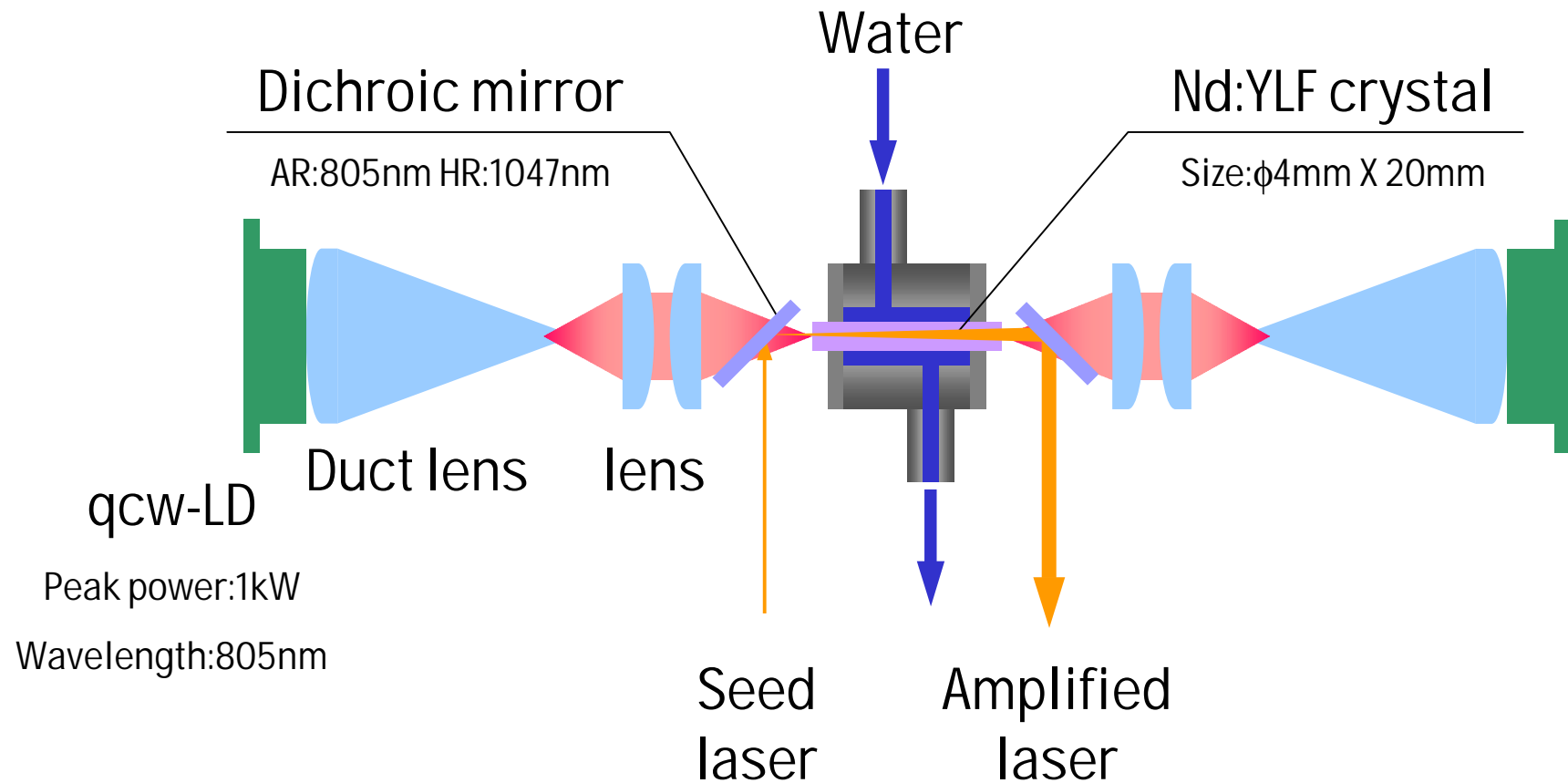
Pointing stability  $\sigma < 20 \mu\text{m}$

Emittance  $4\pi \text{ mm mrad @ } 0.4 \text{ nC, } 14 \text{ MeV}$

Charge  $4 \text{ nC (Max)}$

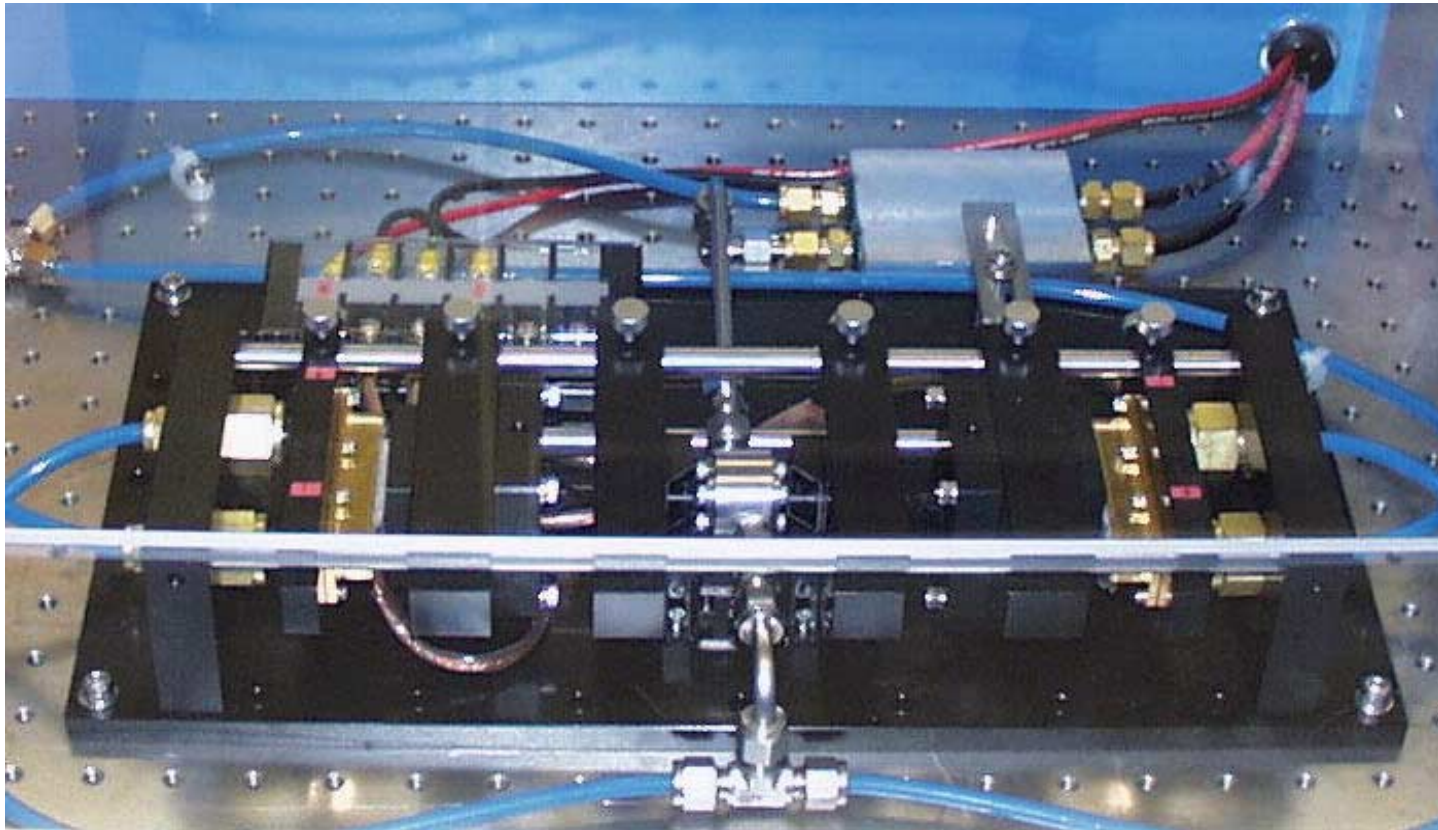


# Nd:YLF Amplifier

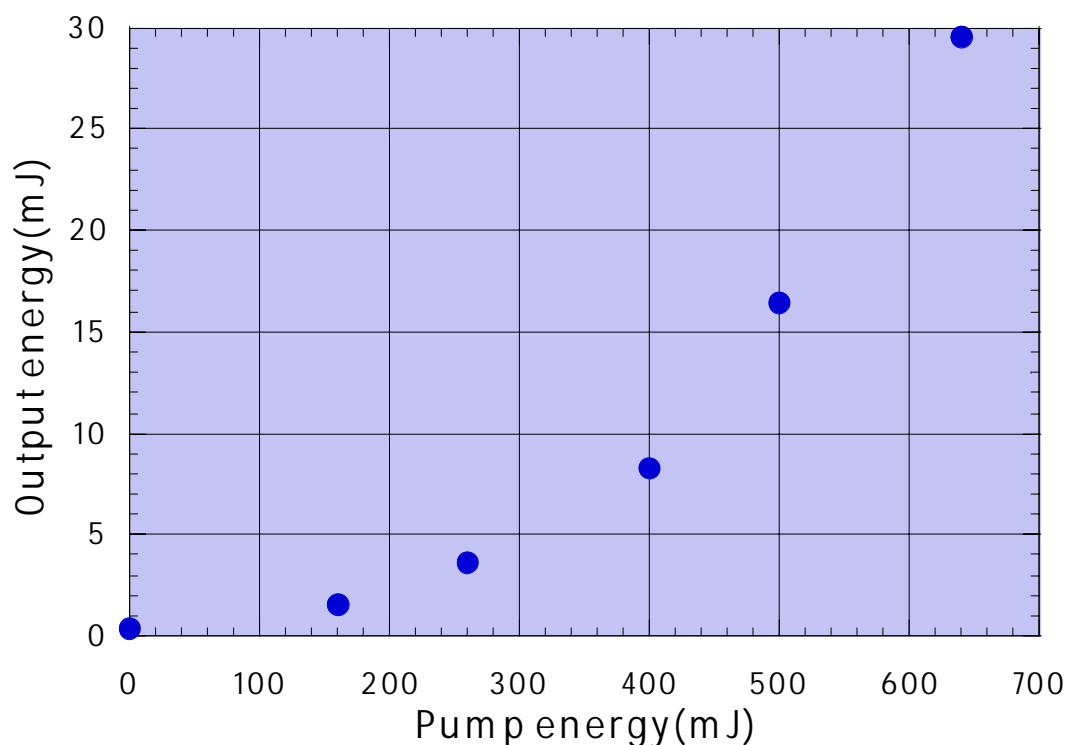


# Nd:YLF Amplifier

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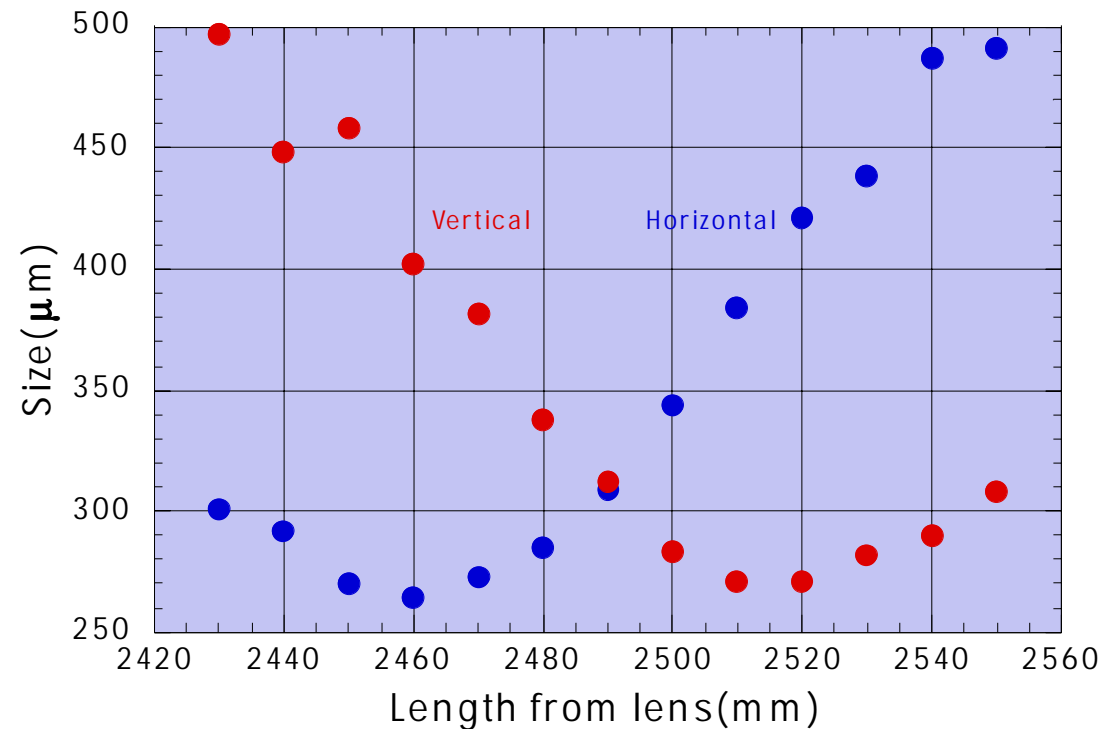
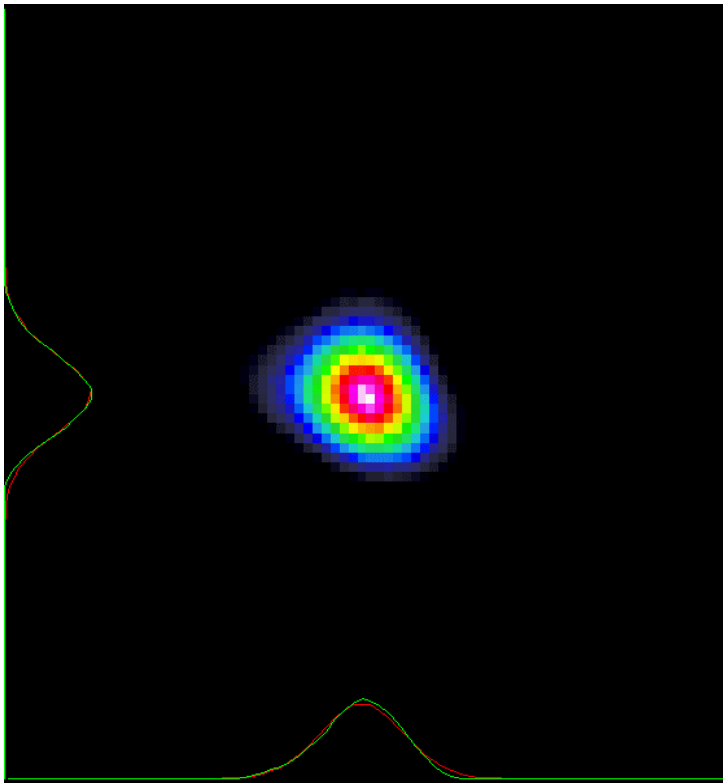


## Amplification with 2-pass configuration



The amplifier was operated as double pass configuration. The seed laser energy was 0.4mJ. The pump laser pulse width was 400 $\mu$ s and the repetition rate was 10Hz .

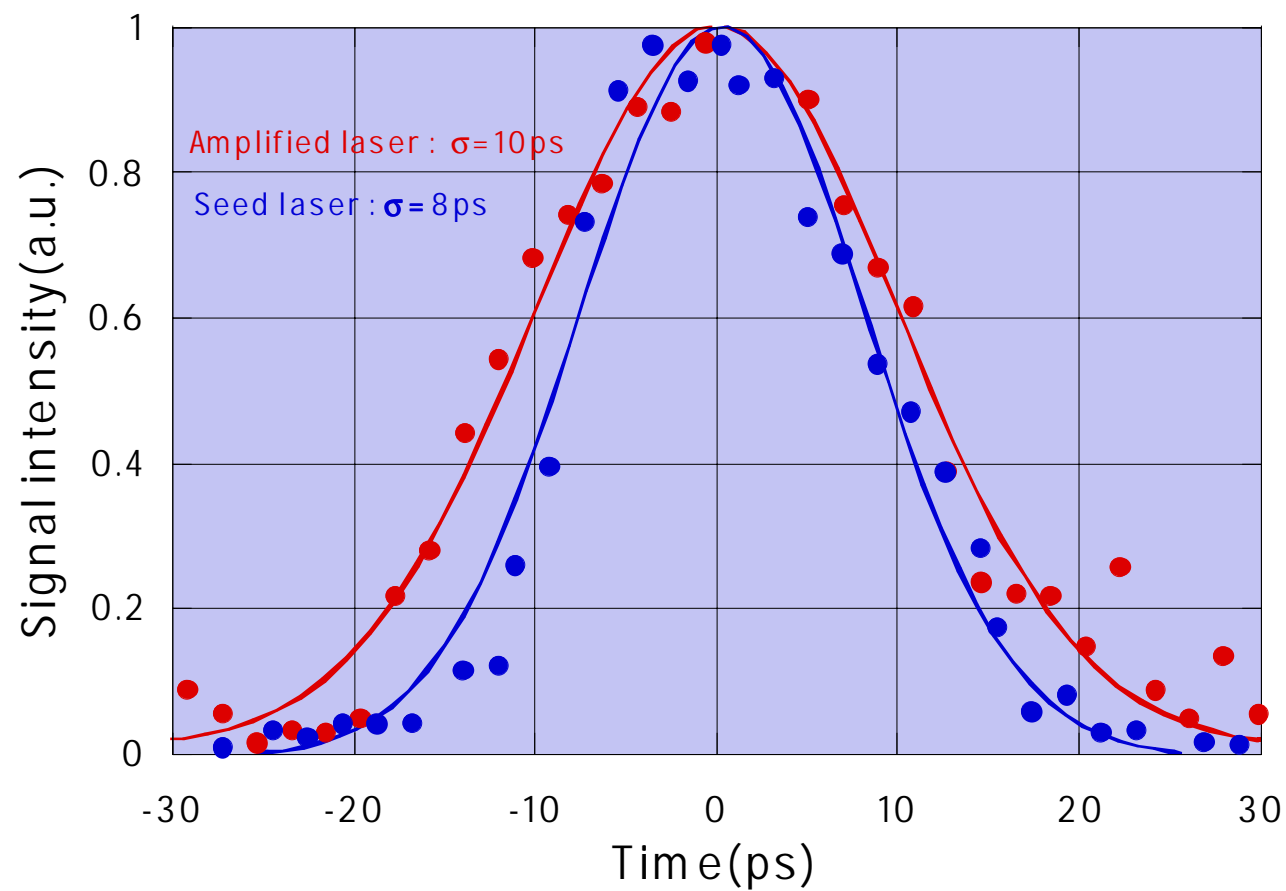
# Beam Profile and Focused Diameter



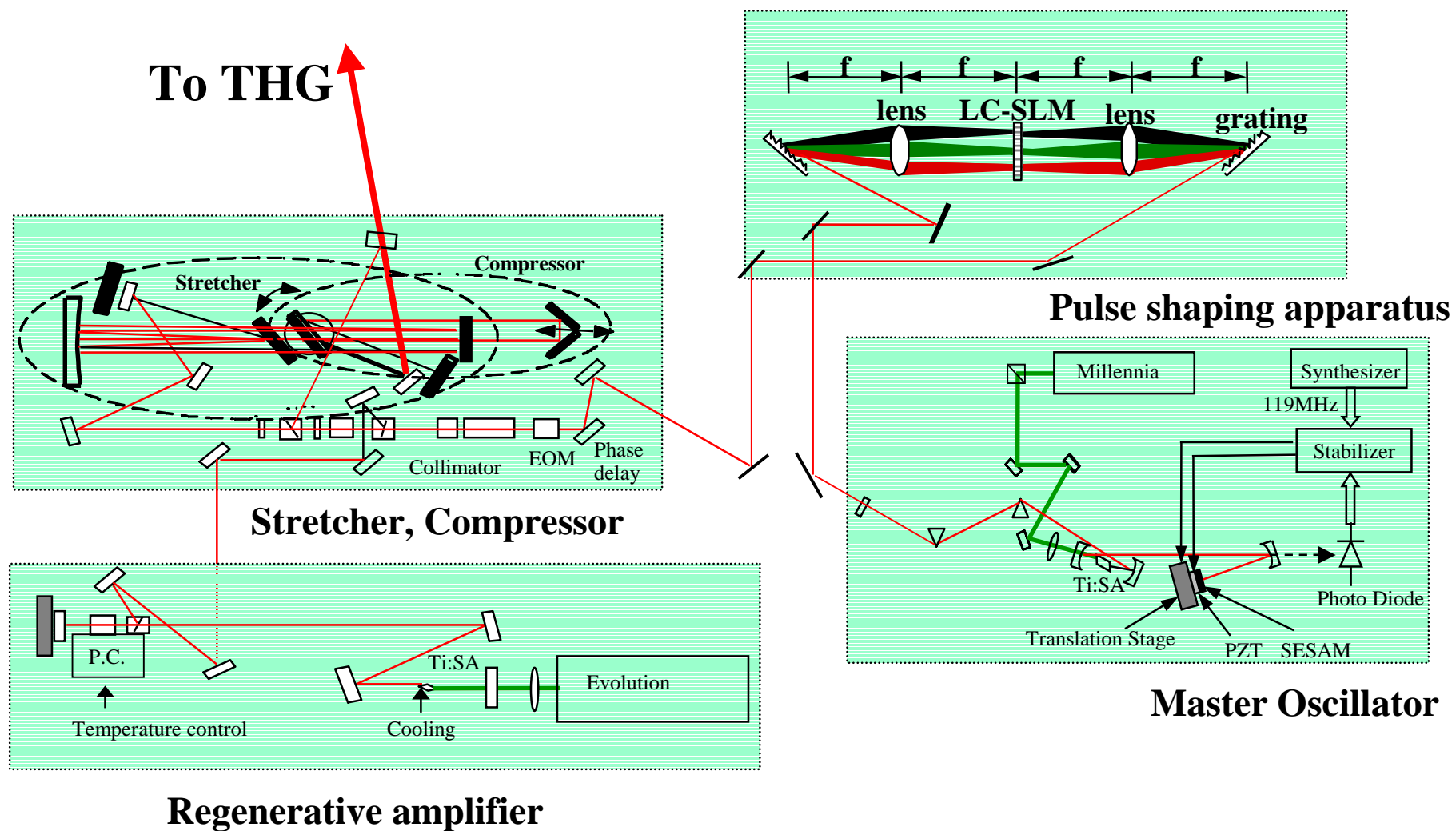
with 2500 mm lens

The beam diameter (the width of the  $1/e^2$  intensity level) was approximately  $300\mu\text{m}$ .

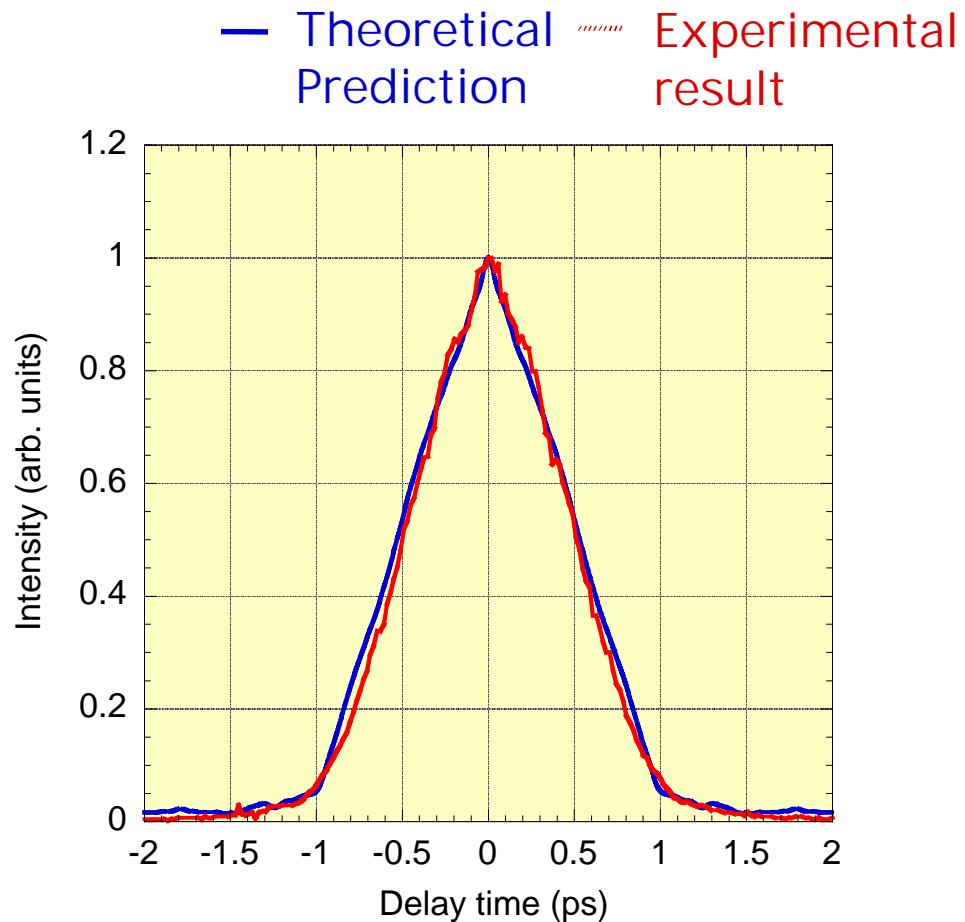
# Pulsewidth



# Square Pulse Shaping with a SLM



# Autocorrelation Trace



Pulsewidth      1 ps  
Energy            0.3mJ (IR)  
repetition        1 kHz

Triangle trace indicates square temporal profile.

# Summery

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## Pulrise

Stable UV laser for photo-injector  
Already open to the market

## Amplifier

Prototype model finished  
Continuing for production model  
Please visit Photonics West at San Jose  
Paper #4267-30  
Poster session 5:30 to 7:00 PM on 1/24

## Square Pulse

Trying to generate THG

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